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Also Sent Via E-mail

Robert J. Wyatt
NW Natural
220 N.W. Second Avenue
Portland, OR 97209

Subject: Human Health and Ecological Risk Assessment Work Plan, NW Natural "Gasco" Site – ECSI No. 84

Dear Mr. Wyatt:

The Oregon Department of Environmental Quality (DEQ) reviewed the "Work Plan, Human Health and Ecological Risk Assessment, NW Natural Gasco Site" dated March 2012 (received March 22, 2012) as supplemented May 29, 2012 (Draft HERA Work Plan). The Draft HERA Work Plan summarizes the process for completing the human health (HHRA) and ecological risk assessments (ERA) for property owned by NW Natural (i.e., the former "Gasco" Site). The Draft HERA Work Plan also presents NW Natural's understanding of agreements reached with DEQ during meetings and by correspondence from January 2011 through Feburary 2012. The May 29th supplement provides additional details regarding NW Natural's proposed "proximity approach" for assigning the results of data gaps sampling to previously sampled locations. Anchor QEA, LLC (Anchor) prepared the Draft HERA Work Plan and the May 29th supplement for NW Natural.

DEQ's comments on the Draft HERA Work Plan are provided below. DEQ's comments are intended to clarify our understandings of agreements reached with NW Natural on the content of the work plan, supply additional details on data use and analysis, update the document to reflect developments that post-date its submittal, and request information items for inclusion in the HERA Report . DEQ requests the Draft HERA Work Plan be revised consistent with our comments and resubmitted for review by March 29, 2013.

GENERAL COMMENTS

Consistency with Later Submittals

DEQ approved and NW Natural submitted the Final Data Gaps FSP[1] after the Draft HERA Work Plan was prepared. DEQ requests the two documents be reconciled. For example, the term "risk area" was removed from the FSP and replaced with "former process and waste management areas." In addition, the method of "ratios" or "proportions" (not regression analyses) is being used to estimate concentrations of data-limited chemicals of interest (COI) and manufactured gas plant (MGP) total petroleum hydrocarbons (TPH) based on the data gaps sampling results. DEQ has provided comments in this letter which attempt to make certain sections of the Draft HERA Work Plan consistent with later submittals, and also requests NW Natural to do a thorough general review of the work plan and revise the document further as needed.

[1] Anchor QEA, LLC, 2012, "Field Sampling Plan, TPH Data Gaps Sampling, NW Natural Gasco Site," June (received June 18, 2012), a plan prepared on behalf of NW Natural.

Risk Characterization

DEQ understands from sections 7.4 and 8.4 that if an area-specific exposure point concentration (EPC) exceeds a human health or ecological soil and/or groundwater screening level, then NW Natural will assume there is unacceptable risk for that exposure pathway for the entire exposure area. DEQ believes the end-point of this approach is likely to be identification of unacceptable risk for soil and groundwater exposure pathways for all exposure areas. As indicated previously in DEQ's May 12, 2010 revisions to NW Natural's March 17, 2010 meeting summary and our October 25, 2011 letter commenting on the Draft Data Gaps FSP[2], DEQ believes the risk assessment must support scoping and planning of the uplands feasibility study (FS).

For purposes of supporting FS scoping and planning, DEQ requests that NW Natural include iso-concentration maps of Gasco Site chemicals of concern (COCs) for soil and groundwater in the HERA Report. DEQ requests that each figure include information regarding sample locations, the medium, exposure pathway, and depth interval(s) depicted. For reference and completeness, analytical results for COCs should be posted on the figures at the corresponding sample location. DEQ also requests the data to be contoured using broadly accepted routines such as kriging, nearest neighbor, or similar method. The justification for the contouring method selected should also be provided in the HERA Report.

Iso-concentration maps will provide information for the site to support evaluations of hot spots of contamination; development of remedial action objectives for specific environmental media; identification of remedial technologies applicable to contaminated media; and risk management decisions. DEQ considers this information essential to the FS given the long complex operational history of the former Gasco Facility; the multiple sources of contamination present; the variety of contaminants exhibiting a wide range of physical, chemical, and fate and transport properties; and the significant occurrence of DNAPL beneath the site.

Using PAH Results to Estimate TPH Concentrations

Subsequent to submittal of the Draft HERA Work Plan, DEQ requested NW Natural to report polycyclic aromatic hydrocarbon (PAH) results associated with analyzing samples collected during the data gaps sampling field work completed in July 2012. The basis for DEQ's request was discussed during a conference call on May 9, 2012 and is provided in e-mails dated May 9 and May 10, 2012. DEQ's request for NW Natural to report results for PAHs was intended to provide data to estimate MGP TPH concentrations at sampling locations where historic data for PAHs are available but TPH data is not. DEQ's May 10, 2012 e-mail indicates that correlations between PAHs and MGP TPH concentrations can be developed using the method of proportions. As indicated in our June 7, 2012 letter approving the Final Data Gaps FSP, the PAH data will be used to support DEQ's review of the HHRA/ERA. Anchor (Taku Fuji) informed DEQ of NW Natural's agreement to report laboratory results for PAHs on July 9, 2012.

Use of EPA RSLs

The Draft HERA Work Plan states in the text and Appendix A (Human Health, Ecological, and Source Control Screening Criteria Matrix [Final Screening Matrix]) that EPA Regional Screening Levels (RSLs) will be used when DEQ risk-based concentrations (RBCs) are not available. This statement is consistent with agreements reached between NW Natural and DEQ (see Note # 1 of the Final Screening Matrix).

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[2] Anchor QEA, LLC, 2011, "TPH Fraction Data Gaps Field Sampling Plan for NW Natural Gasco Site," August (received August 12th), a sampling plan prepared on behalf of NW Natural.

That said, DEQ notes that EPA RSLs are not available for certain human health exposure scenarios identified in our HHRA Guidance[3] including: 1) Construction Workers and the "volatilization to outdoor air" and "vapor intrusion into buildings" exposure pathways; 2) Excavation Workers and the "volatilization to outdoor air" and "vapor intrusion into buildings" exposure pathways; and 3) groundwater ingestion for Occupational Workers. DEQ requests the Draft HERA Work Plan be revised to include this clarifying information.

Based on the information above, there is the potential for site COI without RBCs to be identified during the HERA. In the event such COI are identified, DEQ requests that NW Natural import toxicity and chemical/physical properties information from the EPA RSL tables into our spreadsheets for the purpose of calculating corresponding RBCs for the pathways relevant to the Gasco Site HERA. DEQ considers this approach to be reasonable, straight-forward, and consistent with HHRA Guidance. DEQ makes this request to avoid potential delays associated with preparation of an incomplete HERA Report due to unaccounted for COI in the HHRA.

Human Health Exposure Scenarios

For clarification and to prevent misunderstandings regarding the Final Screening Matrix, based on our review of the Draft HERA Work Plan DEQ understands the June 7, 2012 "Risk-Based Concentrations for Individual Chemicals" for the following soil exposure scenarios will be used in the HHRA as indicated:

- Soil Ingestion, Dermal Contact, and Inhalation (Occupational, Construction Worker, and Excavation Worker) – RBCs compared to the 90-percent upper-confidence level (90UCL) on the mean for each exposure area
- Volatilization to Outdoor Air (Occupational) – RBCs compared to 90UCL on a site-wide basis
- Vapor Intrusion into Buildings (Occupational) – RBCs compared to COI data on a point-by-point basis
- Leaching to Groundwater (Occupational) – RBCs compared to 90UCL on a site-wide basis

For groundwater DEQ understands the HHRA will use RBCs for the following exposure scenarios as indicated:

- Ingestion and Inhalation from Tapwater (Occupational) – RBCs compared to COI data on a point-by-point basis (Alluvium water-bearing zone [WBZ])
- Volatilization to Outdoor Air (Occupational) – RBCs compared to 90UCL on a site-wide basis, except for the LNG Basin which will use data from monitoring wells MW-06-32, MW-10-25, MW-11-32, and MW-13-3 (Fill WBZ)
- Vapor Intrusion into Buildings (Occupational) – RBCs compared to COI data on a point-by-point basis (Fill WBZ)
- Groundwater in an Excavation (Construction and Excavation Worker) – RBCs compared to COI data on a point-by-point basis with monitoring wells MW-06-32, MW-10-25, MW-11-32, and MW-13-3 being used for the LNG Basin (Fill WBZ)

DEQ requests that NW Natural revise the work plan to include the information provided above for clarification, reference, and completeness.

[3] DEQ, 2010, "Human Health Risk Assessment Guidance," October 18, a guidance document that describes methods that may be used to perform human health risk assessments at cleanup sites in Oregon (see http://www.deq.state.or.us/lq/pubs/docs/cu/HumanHealthRiskAssessmentGuidance.pdf).

SPECIFIC COMMENTS

Section 1.1 (Objectives), Page 2. The meeting referenced in the last paragraph of this section was held on May 2, 2012 with NW Natural, Siltronic Corporation, and DEQ in attendance. During the meeting NW Natural requested that DEQ consider an approach for refining the portion of the Alluvium WBZ beneath the NW Natural Site that would reasonably be used for industrial purposes. DEQ agreed to consider the approach and that evaluation is ongoing. In addition, DEQ communicated our expectation that the occupational worker exposure scenario identified in the Final Screening Matrix for the Alluvium WBZ would utilize available groundwater data. In other words, the approach NW Natural requested DEQ to consider would not result in the exclusion of Alluvium WBZ data from the HERA. DEQ has carried this expectation forward since the May 2nd meeting.

Section 2 (Project History). This section of the Draft HERA Work Plan attempts to present the background history of the Gasco Site risk assessment, including providing a chronological list of reports, work plans, correspondence, and meetings from February 21, 2001 to March 8, 2012. DEQ considers the objective of the Draft HERA Work Plan to be summarizing agreements reached by NW Natural and DEQ during development of the current process for completing the HHRA and ERA for the Gasco Site. DEQ believes the current process referenced in Section 2 began in March 2010 when we provided comments on the RI Report[4] and 12/04 Risk Assessment[5]. Given the objective of the Draft HERA Work Plan is to summarize the agreements reached since March 2010, DEQ did not review Section 2 and/or Table 1 for accuracy or completeness. DEQ's decision to not review Section 2 or Table 1 in detail does not indicate our acceptance or agreement with the information presented.

Section 3 (Contaminants of Interest), Page 8. The second paragraph in this section describes the COI that will be evaluated in the HERA and when, or in which document each COI was identified. The paragraph is incorrect. Consistent with DEQ's previous requests the paragraph should be revised. DEQ requested the information be corrected in our October 25, 2011 letter commenting on the Draft Data Gaps FSP. DEQ also requested the correction be made in our January 5, 2012 letter replying to a November 30, 2011 letter summarizing NW Natural's understandings of agreements reached on the risk assessment during a meeting on November 18, 2011. Consistent with DEQ's previous correspondence, the last sentence of the second paragraph of Section 3 should be deleted and replaced with the following:

> "The COI list also includes 1,2,4-trimethylbenzene (TMB), 1,3,5-TMB, low-molecular weight polycyclic aromatic hydrocarbons (LPAHs), high-molecular weight PAHs (HPAHs), and MGP total petroleum hydrocarbons (TPH) which were identified in DEQ's March 10, 2010 letter commenting on the RI Report. At DEQ's request thiocyanate was added to the COI list during a meeting on January 25, 2011."

Table 2 of the work plan should be revised accordingly.

Section 5 (Data Reduction and Transformation), Page 10. The second paragraph in this section describes how field duplicates will be averaged prior to calculating the EPCs. NW Natural's proposed data averaging rules are provided immediately below and DEQ's comments follow:

- Both Results Non-Detect: NW Natural proposes that the resulting concentration will be one-half the highest detection limit.

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[4] Hahn and Associates, Inc., 2007, "Remedial Investigation Report - Gasco Facility, 7900 NW St. Helens Road, Portland, Oregon," April 30, a report prepared for NW Natural.

[5] Anchor QEA, LLC, 2004, "Revised Baseline Ecological and Human Health Risk Assessment Report," December, a report prepared for NW Natural.

- One Result Detect/One Result Non-Detect: NW Natural proposes that the resulting concentration will be the average of the detected concentration and one-half the detection limit for the non-detected result.

DEQ does not approve NW Natural's proposed averaging rules. Results of field duplicates or replicate samples should not be averaged prior to the calculation of soil EPCs. Duplicates and replicates should be included in the calculation as discreet samples consistent with DEQ's Ecological Risk Guidance[6] as indicated below:

- For soil and sediment, duplicate samples should be used as additional single data points in the EPC computation. In cases where one of the results is non-detect and the other is detected, each value should be reported and used independently (i.e., a non-detect value should not be averaged with a detected concentration).
- Water samples should be handled by averaging detections in the sample and it's duplicate; averaging the detected concentration and the method reporting limit (MRL) if one result is non-detect; or using the MRL if both are analyses are non-detects.

DEQ requests NW Natural to revise Section 5 consistent with DEQ guidance as described above.

Section 5.1, Calculating Estimated Concentrations of 1,2,4-TMB, 1,3,5-TMB, and 1- and 2-Methylnaphthalene, Page 10. DEQ requests NW Natural to replace this entire section of the work plan with Section 5.3.1 of the Final Data Gaps FSP.

DEQ notes that the total concentrations of PAHs are identified in Table 2 as COI for the HERA. According to Note #2, 2-methylnaphthalene is included in estimates of total concentrations of LPAHs. Besides 2-methynapthalene and for completeness, DEQ requests that 1-methylnapthalene be included in estimates of total concentrations of LPAHs for the ERA. DEQ's comment also applies to the concentrations of these two chemicals estimated using the proportion method. In other words, at locations where laboratory data is lacking, concentrations of these two data-limited COI estimated using the proportions method (also referred to as the "ratios" method in DEQ correspondence) should be included in the LPAH sums.

Section 5.2, Calculating New and Existing TPH Values, Page 10. DEQ's general comment regarding the use of total PAH results to estimate MGP TPH concentrations at locations where TPH data are absent applies here.

Section 6, Calculation of Exposure Point Concentrations, Page 12. NW Natural indicates that EPCs will be estimated using the 90UCL for soil data sets with four or more detections. DEQ has numerous comments regarding this section of the Draft HERA Work Plan which follow:

- Deeper samples should be shifted upwards into the surface soil dataset regardless of whether a surface soil sample (i.e., a sample collected from 0-0.2 feet) is present (see first-bullet of DEQ's comments to Section 7.3.1 for additional information).
- DEQ requests that the work plan fully document the screening criteria used in the HERA. For this purpose a table should be included in the work plan that explicitly lists each Gasco Site COI and the corresponding screening level(s) for each human health (e.g., occupational, excavation, and construction worker) and ecological receptor of concern (e.g., plants, invertebrates, and aquatic biota;

[6] DEQ, 1998, "Guidance for Ecological Risk Assessment, Levels I, II, III, and IV," November (last updated December 2001), a document prepared by DEQ to provide guidance to its employees.

and invertivorous, herbivorous and carnivorous birds and mammals), media of interest (e.g., vapor, soil, sediment, groundwater, surface water), and exposure pathway.

- DEQ requests the work plan provide a table that details the use and integration of soil sampling results, including the results of data gaps sampling and previously collected sampling data; into a single dataset for developing soil and groundwater EPCs for each exposure area and exposure scenario. The table should clearly show which samples will be included in EPC calculations, and which samples will not be included. DEQ requests that NW Natural use the attached example or its equivalent for this purpose.
- Based on recommendations from EPA's ProUCL Version 4.1 User Guide (see EPA/600/R-07/041, May 2010), sample sets should consist of a minimum of 8-10 samples for calculation of 90UCLs using parametric statistical methods. When utilizing non-parametric methods (e.g., Bootstrap Methods), EPA recommends minimum sample sets of 10-15 points. When the minimum size for a sample set has not been met, the maximum detected value should be used.
- For estimating groundwater EPCs, DEQ approves using the maximum detected concentration of a COI at a monitoring well sampled less than four times. For monitoring wells sampled more than four times DEQ does not approve NW Natural's proposal to use the maximum detected groundwater concentration from the last four sampling events. DEQ's position is based on our review of concentration trends for benzene, HPAHs, and LPAHs provided in appendices C, D, and F of the 11/12 Environmental Monitoring Report[7]. In general, most monitoring wells either exhibit relatively stable trends (e.g., benzene in MW-5-100), or trends that are stable overall but cyclical (e.g., HPAHs in MW-01-22). Fewer monitoring wells exhibit upward (e.g., HPAHs in MW-1-25) or downward trends (HPAHs in MW-04-57). In addition, DEQ notes increases in the MRLs for many COI occurred during recent sampling events, including the previous four. Based on this information, at monitoring wells with more than four samples available DEQ requests NW Natural to develop EPCs for groundwater in the following manner:
  - As was done for benzene, LPAHs, and HPAHs in the 11/12 Environmental Monitoring Report (see tables 6, 7, and 8), use the Mann-Kendall method of trend analyses to identify COI concentration trends in individual wells.
  - If the trend is stable calculate a 90UCL for the entire data set for each COI.
  - If the analysis indicates there is either an upward or downward trend, the 90UCL should be calculated using methods described in EPA Groundwater Monitoring Guidance[8].
- In performing statistical analyses, non-detect values should be managed in a manner consistent with ProUCL guidance.
- DEQ requests that NW Natural provide Microsoft Excel data files for each dataset evaluated in the HHRA and ERA for our information, use, and completeness. Specifically, to assist in our review of the HERA Report, DEQ requests the files be provided in a "Microsoft Excel 1997-2003 format" (i.e., with an ".xls" extension) so we can upload them directly into ProUCL Version 4.1.

For clarification regarding the use of ProUCL, EPA only makes recommendations for the estimation method to use for calculating 95-percent UCLs (95UCLs), not 90UCLs. DEQ generally uses the method recommended by EPA for the 95UCL, but calculated at the 90-percent level. In some cases, this may involve using a 95UCL value to approximate a 90UCL. For example, if based on the data distributions ProUCL recommends using a 97.5% or 99% value for estimating 95UCL values, this information should

[7] Hahn and Associates, Inc., 2012 "Environmental Monitoring Report, Third and Fourth Quarter 2011 – NW Natural Gasco Facility, 7900 NW St. Helens Road, Portland, Oregon," November 26, a report prepared on behalf of NW Natural.

[8] Pg.s 21-23 through 21-33, Chapter 21, *Statistical Analysis of Groundwater Monitoring Data at RCRA Facilities Unified Guidance,* USEPA, EPA 530/R-09-007, March 2009

be used when calculating the 90UCL (i.e., the 95UCL should be selected in order to ensure the 90UCL is covered).

Section 7.2, Potentially Exposed Populations, Exposure Scenarios, and Exposure Routes, Page 13. NW Natural inserts references to a number of documents that predate the 12/04 Risk Assessment (i.e., the 2001 Level II Risk Screening and Receptor Pathway Selection Interim Technical Memorandum) or were not accepted by DEQ (i.e., 6/10 Draft Proposal[9]). As indicated above, DEQ considers the current risk assessment process to have been initiated in March 2010 with our letter commenting on the RI Report and 12/04 Risk Assessment. For clarification, potential exposures to human health, human health exposure scenarios, and exposure pathways identified during the current process for completing the HHRA supersede corresponding information in the documents referenced by NW Natural.

Section 7.2.3, Exposure Routes, Page 15. This section lists the exposure routes that will be evaluated for Occupational Workers, Construction Workers, and Excavation Workers. DEQ's general comment on human health exposure scenarios applies here. In addition, DEQ has the following comments on this section:

- Occupational Worker, Fourth Bullet - This bullet should be revised to indicate that indoor inhalation of airborne volatiles will be evaluated using groundwater and soil data. Soil is not currently included in this bullet; however, Occupational Worker vapor intrusion from soil is included in the Final Screening Matrix.
- Construction Worker and Excavation Worker, Third Bullets for each - These bullets should be revised to indicate that inhalation of airborne chemicals is for outdoor air (to be consistent with the third bullet for the Occupational Worker).

To avoid misunderstanding and to clarify the information provided in the Final Screening Matrix, NW Natural should note that the RBCs and exposure routes described in DEQ's HHRA Guidance do not consider worker exposure to volatile soil contaminants within a trench. The RBCs developed for this pathway are for a semi-confined space (trench) and are based on volatilization from groundwater not volatilization from soil.

Section 7.3, Screening Methodolgy, Page 16. DEQ's general comment regarding EPA RSLs applies here. DEQ's comments on this section of the work plan are provided below:

- DEQ requests that NW Natural use the most current versions of DEQ RBCs and EPA RSLs for purposes of screening site data for the HERA. At the time this letter was written the latest versions of DEQ RBCs and EPA RSLs were issued in June 2012 and November 2012 respectively.
- NW Natural correctly indicates that human health screening for individual COI will be conducted using the criteria and hierarchy shown in the Final Screening Matrix. Although not indicated, consistent with DEQ risk assessment guidance screening must also consider both: 1) the cumulative risk of exposure to multiple carcinogenic and/or non-carcinogenic COI within a given medium; and 2) the aggregate exposure to individual or multiple carcinogenic and/or non-carcinogenic COI within different media.
- As indicated above, DEQ considers soil "direct contact" to include dermal contact and incidental ingestion, and inhalation.

Section 7.3.1, Upland Soil Screen (Final Screening Matrix: Riverbank and Upland Soil Samples), Pages 16 and 17. This section describes the upland soil screening methodology. DEQ has numerous

[9] Anchor QEA, LLC, 2010, "Gasco Upland – Proposal on Risk Assessment Methods," June 21, a technical memorandum prepared for NW Natural.

comments regarding this section that are intended to correct the information presented and/or clarify expectations about the use of available soil sampling data.

- NW Natural indicates that, "As requested by DEQ, data from deeper soil down to 6 feet will be used on a location-by-location basis, where data from the 0-to 3.5-foot interval is not available." For clarification, NW Natural proposed this approach in the 6/10 Draft Proposal. As indicated in DEQ's May 12, 2011 revisions to NW Natural's March 17th meeting summary, DEQ did not accept the 6/10 Draft Proposal. DEQ's position on applying deeper soil sampling data to shallower depth intervals is discussed in our March 10, 2010 letter commenting on the RI Report and the 12/04 Risk Assessment. In general, in the absence of shallow data from a depth interval of interest, DEQ's approach would shift the results of the next deeper sample upward. As indicated in our March 10, 2010 letter, "This should include samples to at least 6 feet bgs, although additional samples are available down to between 8 and 11.5 feet bgs if needed to supplement the dataset." DEQ will use the table requested in our third comment to Section 6 to evaluate NW Natural's use of data and material observations for the HERA.
- NW Natural references risk screening tables provided to DEQ on March 10, 2011 for a meeting on March 17, 2011. DEQ notes the referenced tables are based on the 6/10 Draft Proposal which we did not accept. After receiving the tables on March 10th, DEQ provided comments via e-mails on March 15 and March 23, 2011, and May 12, 2011. The May 12th e-mail also transmits DEQ's revisions to NW Natural's March 17th meeting summary as an attachment. The May 12th e-mail indicates that DEQ's comments on NW Natural's March 17th meeting summary and the data compilation and screening tables should be incorporated into future versions of the tables. DEQ is not aware of the tables having been revised subsequent to our May 12, 2011 e-mail. Consequently, DEQ requests that NW Natural review the e-mails referenced here and address any unresolved comments regarding the data compilation and risk screening tables in the revised HERA Work Plan or the HERA Report as appropriate.
- Consistent with previous agreements, the presence of MGP waste will be used to make determinations about risk at drilling locations where sampling data is not available (i.e., the presence of tar, oil, lampblack, and/or carbon pitch within the depth interval of interest shows unacceptable risk). This criterion should be noted in the table requested by DEQ in the second comment to Section 6. Drilling locations where the presence of MGP waste is used to make unacceptable risk determinations should be identified in the table requested by DEQ's third comment to Section 6.

DEQ also has the following specific comments to correct and/or clarify the information provided regarding the screening criteria and human health exposure pathways mentioned in the section.

- 0 to 3.5-foot Interval (First Paragraph): NW Natural indicates that surface soil EPCs will be screened against DEQ RBCs for: 1) Occupational Worker and Construction Worker "direct contact;" and 2) Occupational Worker "volatilization to outdoor air" and "leaching to groundwater." Consistent with our comment to Section 7.3 above, DEQ requests that "direct contact" be replaced with "dermal contact and incidental ingestion, and inhalation."
- 0 to 12-foot Interval (Third Paragraph): NW Natural indicates that subsurface soil EPCs will be screened against multiple DEQ RBCs, including RBCs for "construction, excavation worker direct contact and groundwater volatilization." The term "groundwater volatilization" is not applicable in the evaluation of soil data and DEQ requests that it be removed. In addition, DEQ requests the words "direct contact" be replaced with "dermal contact and incidental ingestion, and inhalation."
- TPH RBC (Fourth Paragraph): DEQ's comments on the May 29th supplement apply here.

Section 7.4, Risk Characterization, Page 18 and Section 8.4, Risk Characterization, Pages 22 and 23. These sections present the human health and ecological risk characterization methodology, but do not

discuss whether or how cumulative risk will be calculated. As indicated in our comment to Section 7.3, screening must also consider 1) the cumulative risk of exposure to multiple COI within a given medium, and 2) the aggregate exposure to individual or multiple COI within different media. DEQ's general comment on the risk assessment and FS support also applies here.

Section 8.2, Ecological Receptors and Exposure Pathways, Page 20. NW Natural indicates that site-specific ecological receptors and exposure pathways are based on information provided in the 12/04 Risk Assessment. For clarification, modifications to the list of exposure pathways made during the risk assessment process initiated by DEQ's March 10, 2010 letter supersede corresponding information in the 12/04 Risk Assessment and are reflected in the Final Screening Matrix.

Section 8.3, Screening Methodology, Page 21. NW Natural indicates that EPA SSLs, DEQ screening level values (SLVs), and EPA Region 5 bird and mammal soil ecological screening levels (ESLs) derived using no observed adverse effects levels (NOAEL) will be multiplied by five to estimate the lowest observed adverse effect levels (LOAEL). DEQ approves this approach.

Section 8.3.1, Surface Soil (Final Screening Matrix: Riverbank and Upland Soil Samples), Page 21. The first group of bullets in DEQ's comment to Section 7.3.1 applies here. In addition, DEQ agrees that in general EPA SSLs, DEQ SLVs, and EPA Region 5 ESLs will be relied upon for purposes of screening site soil data. That said and for clarification, site-specific values for dibenzofuran and carbazole will be used in the HERA. Furthermore, consistent with the Final Screening Matrix (see Note #6), the text in this section should indicate that Wetland Ponds sediment samples SD-1, SD-2, and SD-3 will be compared to both upland soil ecological criteria and freshwater sediment values. These three samples should also be incorporated into the Tar Pond exposure area and used in calculations of a 90UCL on the mean (or maximum) soil concentration for evaluating the risk of exposure to terrestrial birds and mammals. The risk of exposure to plants and invertebrates should be determined on a point-by-point basis.

Section 8.3.2, Wetland Area Screen (Final Screening Matrix: Wetland Ponds Sediment and Wetland Ponds Surface Water), Page 21. This section of the work plan indicates NW Natural will use DEQ's 2001 Level II Bioaccumulation SLVs to screen the Wetland Ponds sediment samples SD-1, SD-2, and SD-3. DEQ does not approve use of the 2001 SLVs and requests NW Natural to use our 2007 Bioaccumulation SLVs. The text in this section should be revised accordingly.

Section 8.4, Risk Characterization, Page 22. DEQ's second general comment regarding sections 7.4 and 8.4 applies here.

Table 1. NW Natural chronologically lists documents, correspondence, and meetings associated with the risk assessment in this table. DEQ's comment to Section 2 applies here.

Table 2. DEQ requests that Table 2 be revised as follows:

- Note #2 should be revised consistent with DEQ's comment to Section 5.1 which requests that 1-methylnaphthalene, or the estimated concentrations of this chemical based on the method of proportions; be included in the sums of LPAH concentrations.
- Consistent with DEQ's RBCs, naphthalene is considered a carcinogenic PAH for purposes of evaluating the risk to human health via the inhalation pathway. Note #4 should include this information for completeness.
- Note #5 of the table indicates that, "TPH is calculated as the sum of diesel and oil (often reported as motor oil; NWTPH-Dx) and gasoline range hydrocarbons (NWTPH-Gx)." The note is incomplete.

DEQ requests the note be revised consistent with Section 5.2 of the work plan by indicating upward adjustments will be made to historic TPH concentrations determined using EPA Method 418.1.

Figures 2 and 3. These figures do not appear to specifically identify exposure area boundaries for the HERA. DEQ requests the figures be revised to clearly show the boundaries of the human health and ecological exposure areas by: 1) removing any extraneous leasehold, property, and "risk boundary" lines; and 2) adding boundary lines, labels, and/or highlights to identify human health and/or ecological exposure areas. In addition, a note should be added to both figures indicating the exposure areas along the shoreline extend down to mean high water. It also appears borings are missing from Figure 2 (e.g., B-2, B-4, B-5, B-15, B-16, and B-17). NW Natural should review the figures and confirm that all borings and monitoring wells are accounted for on tables and figures prepared for the revised version of the work plan.

Attachment B, Human Health and Ecological Risk Assessment Report (Preliminary Outline). In addition to the comments identified above relevant to the HERA Report, DEQ's comments on NW Natural's proposed report outline are provided below.

- DEQ requests that the HERA Report include tables that fully document data use and analysis, including but not necessarily limited to:
  - Use of data gaps sampling results and the method of proportions to estimate concentrations of data-limited COI;
  - Summing and comparison of historic NWTPH-Gx and NWTPH-Dx analytical results to site-specific MGP TPH RBCs; and
  - Upward adjustments made to historic TPH results obtained using EPA Method 418.1 and use of the data in the risk assessment.
- DEQ requests the report document the method(s) used for calculating the 90UCL concentrations, such as which datasets were used in the calculations and the justification(s) for selecting statistical methods, including supporting information regarding data distributions.
- For purposes of supporting FS scoping and planning, DEQ requests iso-concentration maps for Gasco Site soil and groundwater COCs in the HERA Report. The figures should include information regarding sample locations, the medium, exposure pathway, and depth interval(s) depicted. For reference and completeness, analytical results for COCs should be posted on the figures at the corresponding sample location. DEQ also requests the data to be contoured using broadly accepted routines such as kriging, nearest neighbor, or similar method.
- To the extent practicable and to facilitate our review of the HERA data use and analysis process, DEQ requests the "Site Chemistry Data Tables" in Appendix A and "Risk Characterization Tables" in Appendix D be organized similar to the tables requested in our third comment on Section 6.

May 29, 2012 Supplement. The May 29th supplement provides NW Natural's recommendations for assigning boring locations to former MGP process and waste management areas. As discussed previously, the boundaries of the HHRA and ERA exposure areas and the former process/water management areas do not coincide. More than one former process/water management area can occur within a single exposure area (e.g., Former Tar Pond Area exposure area). NW Natural's recommendations use the "proximity approach" mentioned in the March 2012 version of the Data Gaps FSP to assign data gaps sampling results to boring locations in these situations. DEQ's comments on the May 29th supplement are provided below and we request they be incorporated into the revised HERA Work Plan.

- The supplement assigns samples with existing TPH data to the former MGP process and waste management areas designated for purposes of the data gaps sampling work. DEQ understands the

table is comprehensive. In other words, the table includes all sampling locations with available data and all drilling locations where testing data is absent but MGP residuals are present. DEQ requests that NW Natural confirm, clarify, or correct this understanding. If the supplement does not include the information indicated, DEQ requests the table be revised accordingly. In any case the supplement should be included as a table in the revised HERA Work Plan.

- DEQ requests borings B-8 and GST-05 be assigned to the former Spent Oxide waste management area from the former lampblack waste management area due to proximity (i.e., the borings are not within either area but are physically closer to the former Spent Oxide area).
- The risk assessment work plan should specify how the composite data collected during the data gaps sampling work will be used in the risk assessment. These composites cross exposure units and the work plan should specify how this will accounted for in the risk assessment. This includes the depth intervals from 0-3 feet (human health and ecological risk surface soil exposures) and 3-12 feet (excavation worker soil exposure).

NEXT STEPS

DEQ requests that NW Natural revise the Draft HERA Work Plan and resubmit the document by March 29, 2013. DEQ suggests meeting in early March to discuss this letter and the content of the revised work plan.

Please feel free to contact me with questions regarding this letter.

Sincerely,

Dana Bayuk
Project Manager
Portland Harbor Section

Attachment: Example Table

Cc: Patty Dost, Pearl Legal Group
Ben Hung, Anchor
Taku Fuji, Anchor
Carl Stivers, Anchor
John Edwards, Anchor
Rob Ede, Hahn & Associates
Myron Burr, Siltronic Corporation
Alan Gladstone, Davis Rothwell Earle and Xochihua
James Peale, Maul Foster & Alongi, Inc.
Sean Sheldrake, EPA
Lance Peterson, CDM
Jim Anderson, NWR/PHS
Henning Larsen, NWR/SRS
Jennifer Peterson, NWR/PHS
Mike Poulsen, NWR/PHS
Neil Morton, GeoEngineers
ECSI No. 84 File
ECSI No. 183 File

Individual tables should be provided for each ecological and human health risk assessment scenario by exposure unit. All sample analyses should be accounted for at all sampling depths. Samples used to calculate the EPC for the specific exposure area and exposure scenario indicated should be highlighted from this complete list.

EXAMPLE: Former Spent Oxide Area - Surface Soil Ecological Terrestrial (Mammal)

Notes

List all samples available in exposure unit

Include depth of all soil

Identify each metal analyzed for if sample analyte list is different from, or a subset of, the COI list shown (Ex., three metals tested for...Pb, As, Cd)

	Loc Code	Sample ID	start dep (ft)	end dep (ft)	sample date	Metals - Sb, As, Be, Cd, Cr, Cu, Pb, Hg, Ni, Se, Ag, Tl, Zn	Cyanide[1] Compounds	PAHs	SVOCs[2]	TPH	BTEX	VOCs[3]	PCBs[4]	Pesticides[4]
Highlight samples used to calculate EPCs for specific exposure area & exposure scenario	B-01	950921-B1-01	0	0.2	9/21/95									
	B-01	950921-B1-02	0	0.2	9/21/95	Pb, As, Cd								
	B-01	950921-B1-05	10	10.5	9/21/95									
	B-01	950921-B1-06	11.5	12	9/21/95									
	B-03	950921-B3-05	10	10.5	9/21/95									
	B-06	950927-B6-02	7.5	8	9/27/95									
	B-36	000828-017	0	0.2	8/28/00									
	B-36	000828-018	3	3.5	8/28/00									
	B-36	000828-019	9.5	10	8/28/00									
	B-37	000828-001	0	0.2	8/28/00									
	B-37	000828-002	4	4.5	8/28/00									
	B-37	000828-003	10.5	11	8/28/00									
	GS-00	GS-00-S (4-6)	4	6	11/1/06									
	GS-00	GS-00-S (9-11)	9	11	11/1/06									
	MW-01-22	951024-M1-01	0	0.2	10/24/95									
	MW-01-22	951024-M1-02	3	3.5	10/24/95									
	MW-02-32	951106-M2-01	0	0.2	11/6/95									
	MW-02-61	981007-M2-01	1.5	2	10/7/98									
	MW-02-61	981007-M2-02	5	5.5	10/7/98									
TOTAL COUNTS						Pb:1; As:1; Cd:1								

Notes:

1. Cyanide compounds include total cyanide and thiocyanate for soil and sediment; and thiocyanate and total, free, and available forms of cyanide for water
2. SVOCs include 1-methylnaphthalene, 2-methylnaphthalene, dibenzofuran, carbazole, and phenolic compounds
3. VOCs include 1,2,4-trimethlbenzene and 1,3,5-trimethylbenzene
4. NW Natural has previously included PCBs and Pesticides in tables for the riverbank exposure area

Prepared by DEQ for NW Natural's use in the revised HERA Work Plan